Inter-segmental Foot Kinematics during Gait in Elderly Females with Symptomatic and Asymptomatic Hallux Valgus

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Inter-segmental foot motions in children and adolescents using a three-dimensional multi-segment foot model

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My disclosure is in the Final AOFAS Mobile App. I have no potential conflicts with this presentation.
Introduction

• **Effect of hallux valgus on gait**
  - progressive subluxation of the 1\textsuperscript{st} MTP joint → interfere efficient toe-off
  - Several studies using plantar pressure : inconsistent findings
  - **Still not clear**
Effect of hallux valgus on gait

- Canseco et al. (Foot Ankle Int, 2010)
  - Milwaukee foot model
  - decreased velocity and stride length, prolonged stance
  - the ROM of the hallux (sagittal plane) & forefoot (coronal-transverse plane)
  - no radiographic assessment
  - wide range of age, gender
    (24 – 72 years)
Materials & Methods

• Criteria of hallux valgus
  - HVA > 20

• Study Population
  - Symptomatic HV pts (SHV group, n=18)
  - Control group from Healthy older adult (F, age 60~69)
    • Asymptomatic HV group (AHV group, n=14)
    • Control group (CON group, n=36)
Experimental procedures

- **15 reflective marker set (Foot 3D model)**
  - Added 6 additional markers to conventional Cleveland marker set
- **Walk at comfortable speed along an 8 m walkway**
- **Gait data collected using 12 cameras**
- **Optical motion capture system**
  - Motion Analysis Co., Santa Rosa, CA
- **Data acquisition**
  - Temporal gait parameters
  - Inter-segmental motion
Symptomatic HV vs Asymptomatic HV

- Stride length, and step width ↓
- The proportion of the stance phase in a gait cycle ↑
- Range of motion (ROM) of hallux sagittal plane motion & forefoot transverse plane motion ↓
- Hallux segment was in more dorsiflexed position
- Loss of push off during preswing
- Forefoot abduction motion during terminal stance was decreased
Symptomatic HV vs Control

- Speed, stride length, and step width ↓
- The proportion of the stance phase in a gait cycle ↑
- Range of motion (ROM) of hallux sagittal plane motion & forefoot transverse plane motion ↓
- Hallux segment was in more dorsiflexed position
- Loss of push off during preswing
- Forefoot abduction motion during terminal stance was decreased
Asymptomatic HV vs Control

- No difference in temporal parameters
- No difference in ROM of inter-segmental motion
- Hallux segment was in more valgus position
Subgroup Analysis

- **Severe HV (HVA > 40, n=10) vs Moderate HV (20 < HVA <40, n=8)**
  - Speed, stride length, and step width ↓
  - Stance phase prolongation
  - ROM of hallux sagittal plane motion & forefoot transverse plane motion ↓
  - Loss of push off during preswing

- **Moderate HV (n=8) vs AHV (n=14)**
  - No statistical difference except hallux transverse plane
Conclusion

- **Symptomatic hallux valgus** patients showed different gait parameters & inter-segmental motion during gait when compared with age-matched controls.

- **Asymptomatic hallux valgus** does not affect gait & inter-segmental motion during gait.

- The results of this study suggest that effect of moderate hallux valgus itself on foot kinematics might be limited while pain or arthritic change of the joint might cause changes in gait in patients with symptomatic HV.
References